

THURSDAY, JULY 10, 1873

THE ENDOWMENT OF RESEARCH

II.

IN a recent number attention was drawn to the public importance of original research in the Sciences, and it was insisted that certain funds which lie ready to the hand should be devoted towards the maintenance of those who undertake the national duty of extending the bounds of scientific knowledge.

In this article it is proposed to strengthen those positions by a reference to the already published evidence of the Royal Commission at present inquiring into "Scientific Instruction and the Advancement of Science." The object of the labours of the Commission is twofold, but concerning the former part nothing need now be said, except that regulated activity in independent investigation is the main condition upon which depends successful teaching alike in the individual professor, and the scientific schools of the nation.

The Commission was especially directed to ascertain how far the endowments of the Universities and Colleges might be directed to aid the needs of Science. On this point much valuable evidence was given by several distinguished members of our two wealthy Universities, and there was a general agreement of opinion that so far as Instruction and Examination are concerned, the Universities are showing a praiseworthy disposition to encourage their scientific students. On the other hand, it was universally admitted that the Oxford Science-school, despite the excellent teaching of its professors, is not progressing so well as might be expected, and that the University is lamentably deficient in that part of its functions which is concerned with the promotion of knowledge for its own sake.

Among the Oxford witnesses Sir B. Brodie, who was at the time that he gave his evidence Waynflete Professor of Chemistry, is conspicuous as well for the precision with which he pointed out the causes of the present defects, as for the definiteness of the scheme by which he proposed to remedy them. According to him, "Universities are Institutions of which the object is, in the first place, to promote scientific education and to diffuse scientific knowledge, and in the second place to preserve and to extend scientific knowledge." He was of opinion that "the latter of these duties is at present not sufficiently kept in view, whereas in old days the case had been different." His suggestions were that "the University should establish, on a larger scale than now, museums and scientific collections, for the present ones are organised too much with a purely educational object; and secondly (a point to which he attached by far the most importance), that the means of existence and of scientific study should be provided for certain professors or individuals, by whatever name they may be called, whose chief function should be scientific investigation and the representation and advancement of their various special Sciences."

He further went on to suggest that "these professors should be, to a great extent, separate from the ordinary teaching staff of the University, professors of the Science

itself, rather than professors of the teaching of the Science:" that "in their lectures they should give to the public what they have attained for themselves, and have under them a limited number of pupils as assistants in their own original researches." The case of Liebig at Giessen will naturally suggest itself to our readers as an apt illustration of the particular mode of advancing Science here advocated; and from the evidence of Sir W. Thompson before the Commission it may be learnt that both at Glasgow and at Owens College a somewhat similar plan is being energetically carried out.

Sir B. Brodie, however, would appear with characteristic zeal to go even one step beyond this, for he instances as "a capital example of such a foundation as he would desire the Radcliffe Observatory at Oxford, where the observer gives no lectures at all, is not even attached to the University, but solely put there to do astronomical work. The Board of Curators, themselves not necessarily members of the University, having large funds at their disposal, give to the observer whatever he wants, whilst he on his part, as the sole evidence of his industry, makes an annual report on the condition of the observatory and the work done, and publishes certain tables." Here we also think that we have found, so far as the theory of the institution goes, an admirable model of the manner in which the cultivation of Science for its own sake may be endowed with great advantage to the country and without any manifest risk of sinecurism. In the language of the Dean of Christ Church, "we should very much like to see eminent men residing at Oxford only partially employed in teaching, but employing a great part of their time in scientific research."

With reference to the endowment of research here advocated it is necessary that a warning should be explicitly given against dangers which threaten from two different sides. On the one hand it is most important, in England more than in other countries, that the simple pursuit of Science as knowledge should not be confounded with the practical application of scientific truth to the numberless arts of modern civilisation. Applied Science is a profession which promises to become of a highly remunerative character. The analyst, the engineer, and the electrician may require pecuniary help and regulation from the Central Government for their technical schools, but they emphatically do not require to be themselves supported by national endowments. On the other hand, the ordinary scientific teacher at the universities, where not the poor but the rich as a rule are taught, should not in our opinion be regarded *quâ* teacher as the proper recipient of the funds of an endowment. It may very well be that while education in Science is struggling towards recognition, the teachers may claim some sort of aid to put them on a level with those branches of instruction which have the advantage of ancient prestige; it may also be thought advantageous that certain teachers should receive endowments, not for the tuition they give, but for the investigations they are carrying on independently of their other work; yet it must be granted that either of these cases is of an exceptional character.

On all hands are to be seen the disastrous consequences of endowing teaching proper, and of compelling original research to take its chance at the hands of the

amateur. It must happen that the professor (so called) will be constrained to give up the whole of his time to the duty which is most expected of him, and that original research will suffer both in quantity and in quality. The most general principles of political economy are sufficient to show that in a wealthy and moderately enlightened country the remuneration of teaching had better be regulated by the equitable standard which impartial competition will not fail to establish. It is for those subjects which, though of essential importance to the welfare of the country, are in themselves naturally unremunerative, that the old endowments for the promotion of education and knowledge, whatever may have been the particular means by which these ends were originally to be attained, are now required. Among these subjects disinterested application to pure Science is manifestly the chief.

In a subsequent article we propose to show that the funds of the Colleges cannot be more consistently applied than to this purpose, and that the progressive well-being of the Universities mainly depends upon the degree to which they are concerned in the advancement of knowledge.

C.

THOMÉ'S *LEHRBUCH DER ZOOLOGIE*

Lehrbuch der Zoologie. Von Dr. Otto Wilhelm Thomé; Pp. 416. (Brunswick: 1872.)

IF Germans wonder, not without reason, who buy our manuals of microscopic mounting, Englishmen may equally wonder for whom such books as Dr. Thomé's are written. We have technical treatises on special branches of zoology, and we have popular natural history books, but a manual like this would find a poor sale in England. It is a school manual, and its existence is explained by the introduction of zoology to some extent into the curriculum of the German gymnasia and much more into that of the Realschule, which more or less correspond to the "modern side" of our public schools, or may be described as answering in intention, though of course immeasurably superior in performance, to English "commercial schools." Whether zoology ought to form a regular part of school work, even where room is made by giving up Greek altogether and Latin more or less, is an important question. As a part of *education* in the proper sense of the word, it is so inferior in exactness, in conciseness, in facility of demonstration, and convenience for observation and experiment to such rivals as botany, physics, and even chemistry, that its claims may practically be ignored. Moreover, looking at school work from another point of view, it is obvious that any scheme of utilitarian *instruction* which is good for much must include ignorance of the greater part of human knowledge, in order to provide for acquaintance with the rest; and the first addition to the indispensable elements of reading, writing, and arithmetic would probably be claimed for geography, political economy, or the rudiments of hygiene, as more useful branches of knowledge than zoology. A boy with a bent for natural history would gain far more good from reading the bits of zoology in such books as the "*Voyage of the Beagle*," the "*Malay Archipelago*," or "*Kosmos*," and by collecting bird's eggs or butterflies, than he would by painfully wading through the details of Dr.

Thomé's closely printed pages. And when zoology is taken up as a serious study by older students, most teachers will agree that the best plan is for them to begin by a careful study of a particular branch of the subject, with the help of such a handbook as Flowers' "*Osteology of the Mammalia*."

Looking to the object of the book, the reader will find Dr. Thomé's work fairly done. The first hundred pages are devoted to a popular sketch of human anatomy and physiology, from which all notice of generation and development is excluded. Otherwise it is as complete as the space will allow. The remainder of the book describes the several classes of animals, beginning with Mammalia and following the arrangement into seven types—Vertebrata, Mollusca, Arthropoda, Vermes, Echinodermata, Cœlenterata and Protozoa—which is now generally accepted among German naturalists. A diagram of these types is given, which might serve for a genealogical tree; but no hint of this intention is given. The sub-division into classes and orders is not particularly good. Thus among Mammalia the Sirenia are confounded with the Cetacea, Ray's obsolete distribution into Ungulata and Unguiculata is preserved, and the orders Ruminantia and Pachydermata appear, as if nothing had been done to clear up the real affinities of these groups since Cuvier published the "*Regne Animal*." The classification of birds is not more unsatisfactory than that of other writers; and in the class of fishes Müller's orders are commendably followed. Tunicata and Bryozoa are of course excluded from Mollusca, and help to fill the lumber-room of Vermes. A very large share is, as usual, given to the account of insects, while marine zoology and the Protozoa receive comparatively little attention.

Three hundred and fifty-eight woodcuts make an important feature of the work. Most of these are good in themselves and well printed. Those illustrating human anatomy and histology are the best, and almost all borrowed from Henle. No indication of this or any other source is given, but it is easy to recognise that some of the figures have been taken from the admirable cuts in Bell's "*British Reptiles*," others from Forbes, Milne-Edwards, and other well-known works; while some of the Mammalia appear to have been drawn from children's toys. Fig. 350, of a sponge, is a curiously modified reproduction of the original drawing in Grant's "*Outlines of Comparative Anatomy*" (p. 312). Of the thirty-one figures of birds, twenty-seven represent European species, and of these all but four are copied from Yarrell's *British Birds*. One excellent addition to each figure is a note of the relation it bears to the actual size of the animal represented, or of the average length of the latter. There are not many figures of anatomical details, but almost all are good, some being taken from Gegenbaur's "*Vergleichende Anatomie*."

To compare Dr. Thomé's book as a whole with serious scientific treatises even of the second class, like that of Claus, would be unfair: but even as a "cram-book" it is inferior to Nicholson's *Zoology*: and it gives far too little space to descriptions of the habits and character of well-known groups like mammals, birds, and insects, to be really popular. Such books as Knight's "*Museum of Animated Nature*" are much more interesting and quite as scientific.

P. S.